

**Planning for the Future in Turbulent Times:
The Academic Perspective**

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By

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It is a pleasure to speak to the Southeastern members of the American Association for the Advancement of Science. My topic concerns the research enterprise in the university and the challenging times we face. After 40 or more years of steady support of the research agenda of this nation, we face new, and potentially difficult circumstances. Keeping in mind that the federal government provides about 55% of all research funding for universities, let me cite some of the recent statistics that give us reason for concern...

1. Total federal R&D expenditures in real dollars peaked in 1989, and the percentage of national R&D expenditures funded by the federal government declined from 50% in the early 1980's to about 40% today. From an international perspective, it is notable that in the next few years, the Japanese government will overtake the U.S. government in funding for non-defense research and development.
2. In the process of reducing the federal budget deficit by the year 2002, it is predicted that funding for research is likely to decline by as much as 35% from today's levels.
3. Industry funding of research, while tripling from 1970 to 1993, amounts to only 7% of the total research support of universities, and will not make up for the potential decline of federal support.
4. A growing reliance on industrial support will force universities towards research with short-term objectives, and leave important long-term, basic research under funded.
5. With shifts of responsibilities for federal welfare and medical support programs to states, states will have greater difficulty playing a major role in support of research, and they cannot provide the central coordination that comes from the federal sector.

So the news is not good. But I would like to suggest that, as with the report of Mark Twain's death, the demise of the nation's university research enterprise is highly exaggerated. There is an old good news-bad news joke about academia that fits this topic. On an un-named college campus, the provost rushes into the office of the president and announces that he has some bad news and some good news about faculty morale. The bad news is that a survey of the faculty has shown that morale is at an all-time low. The president asks what is the good news? Provost's reply, "it has never been higher."

To a certain extent, we can be like the fictional survey of faculty morale and believe the worst is upon us, or we can set about controlling our destiny. I believe the latter is the preferred course of action. It is also my belief that those of us located in the southeast have a greater challenge than others in the coming changing environment if we are to come to the

end the next decade as winners. To be successful, we must understand the underlying elements we will work with, and where we stand within them.

The National Agenda for Research Universities

Looking back, it is accepted that technological research helped lead to the Allied victory in World War II and this, in turn, was crucial to the creation of the federal infrastructure that has supported university research since then. I mention this because of the military connection, one when combined with the cold war and its objectives, was a driving force that continued to feed the research agenda. In 1946, then-General Dwight D. Eisenhower summed up the climate by saying in a memo: "The lessons of the last war are clear. The armed forces could not have won the war alone. Scientists and businessmen contributed techniques and weapons which enabled us to outwit and overwhelm the enemy." The support for research was established and it grew for decades with Americans embracing the vision of Vannevar Bush and his Endless Frontier philosophy.

With the end of the cold war, factors driving the national consciousness moved from military issues to economic ones, reflecting our nation's seeming decline in ability to compete in a new global marketplace. Justification for university research funding shifted from military to economic and health issues.

For example, the report, "Technology and Economic Growth: Producing Real Results for the American People," put out by the U.S. Council of Economic Advisors in October 1995 states, "Investments in science and technology produce real results for the American people. As much as half the nation's economic growth since World War II can be traced directly to advances in science and technology."

Another example comes from a 1995 open letter to Congress signed by 16 of the CEOs in America's leading technological companies. The letter states:

"Imagine life without polio vaccines and heart pacemakers. Or digital computers. Or municipal water purification systems. Or space-based weather forecasting. Or advanced cancer therapies. Or jet airliners. Or disease-resistance grains and vegetables. Or cardiopulmonary resuscitation (CPR)."

The letter goes on to say that those breakthroughs were made possible by the partnership between research universities, industry, and the federal government. One passage of the letter deserves special comment, and I quote:

"This partnership-the research and educational assets of American universities, the financial support of the federal government, and the real-world product development of industry, has been a critical factor in maintaining the nation's technological leadership through much of the 20th century. Just as important, university research has also helped prepare and train the engineers, scientists, and technicians in industry whose discipline and skill have made technological breakthrough possible."

The word partnership is important. While universities have worked in partnership with the federal government and industry in the past, the future is going to demand more of this concept if we are to be successful. Also, it is notable that state funding is not mentioned, and this element cannot be overlooked as we lay plans for the future.

In Georgia we are fortunate to have in place an innovative concept called the Georgia Research Alliance (GRA) which you heard about this morning from Bill Todd. Thanks to Governor Zell Miller and the Georgia Legislature, over \$20 million is available annually to

Georgia's six research universities to compete for federal and industrial funding within the concept of university-industry-state government partnering. This effort is focused on biotechnology, environmental technology and telecommunications, three areas important to the future of Georgia's economy. The GRA is a model that works in bringing together the players who have vested interests in the research agenda.

Southeastern Perspective

The growth in research and understanding of its importance to the economy was a concept late in coming to southeastern states and their universities. The AAAS report published in conjunction with this meeting provides statistics about the present state of federal support of research universities in Georgia and shows that while Georgia is 2.7% of the total population of the U.S., its research universities have only 1.9% of the federal funding obligations. These data are important and need further explanation to understand why southeastern universities are not as well positioned as those in other regions for the future.

Before going further, I need to take a moment to explain the different measures of research funding. The AAAS report uses a parameter termed "federal obligations," to define level of funding. Personally, I believe the numbers associated with obligations do not appropriately reflect research activity for universities and can be misleading. I, and many others, prefer research expenditures as a more consistent and reliable indicator of activity, I will use this in my subsequent remarks. For example, in Table 3 of the AAAS report, Georgia Tech is shown for 1993 to have a federal obligations level of \$50.8 million, 66th nationally. On the other hand, in 1993 Georgia Tech was 32nd nationally in federal R&D expenditures with \$98.4 and 31st nationally in total R&D expenditures with \$175.8 million.

As relative newcomers to the research enterprise, southeastern universities tend to lag other regions in research expenditures. As recently as 1975, only four southeastern universities ranked in the top 50 nationally for research expenditures. Georgia Tech was not among this number. By 1994, the latest date for which we have official information, nine southeastern universities were in the nation's top 50, with Duke ranked highest at 25th, followed by UNC at 27th, Georgia Tech at 29th and the University of Georgia at 32nd. However, in spite of the considerable progress, no southeastern university has yet broken into the top twenty.

Recognition of the work of our scientists and engineers has also lagged other regions, as evidenced by membership in the NAS and NAE. As of 1995,

Universities in	NAS members	NAE members
California	428	198
Mass and NY	393	171
Midwest states	160	87
Va, NC, Ga, Fla	56	44

Again, progress has been made for the southeast in these memberships in recent years, but we still are far behind. This reflects the need for greater maturity in the research activity and national reputations of our faculties.

It is important to note that while the growth of our research endeavors in the southeast are important to the universities themselves, the impact on the economy is what counts to the average citizen. To this end, there is an interesting, and I believe not coincidental, linkage between the rise of research activity in the universities of the southeast, and the growth of personal income. In 1980, per capita income in the southeast and Georgia was 85% of the national average, while in 1994 per capita income in the southeast had risen to 90% of the national average and reached 93% in Georgia. This growth paralleled that of the research activity in southeastern universities. On a more specific level, we know that research universities have a direct effect on productivity of industry. A recent survey by Coopers & Lybrand showed that companies with ties to a research university have productivity rates almost 2/3 higher than their peers.

The data I presented on research activity by universities are intended to show that in the southeast, research is still a young endeavor, and is subject to rapid decline under adverse conditions. Thus, I am convinced that our universities are more at risk in the upcoming challenging environment. Linked to this will be the prospects for prosperity in our region and the income of its citizens.

Meeting the Challenges

The question is, what is our action plan?

To begin, we need to work in concert with our colleagues in other regions of the nation since we face many of the same issues. But we also have to recognize the differences between our circumstances.

Second, and I cannot emphasize how important this is, we have to put great effort on our own campuses to offset the excesses that can characterize the research university. This means providing the appropriate balance of effort to undergraduate and graduate programs, bringing research into the classroom and the curriculum, reducing class sizes and improving advising for undergraduates, and being more flexible about when tenure is granted and how the campus evaluates faculty for promotion and tenure.

Third, we have to adapt our disciplinary academic order to the growth of the interdisciplinary needs of the world. There is not a good match between these two, and it requires effort to overcome the inherent inertia that prevents the fit.

Fourth, we have to build upon the partnerships that were mentioned earlier between universities, industry and government, both federal and state. This requires new thinking on the part of all of the partners, universities included. The Coopers and Lybrand survey that illustrated the positive impact of industry ties to universities also showed that such ties were far too infrequent. The role of the state also cannot be underestimated if those of us in the southeast who are just arriving as research universities are to continue to successfully compete. The GRA is an example that can be cited as an example for creating positive partnering in the interest of strategic economic objectives.

Fifth, we need to explain, and be able to justify, the worth of our research to the public. The average citizen does not often appreciate or understand much of what we do.

Sixth, we have to build the infrastructure of administrative and financial systems to support the growth of research and improved usage the funds we receive. We cannot be perceived as bad managers.

Finally, with our industrial partners, we need to work with congressional and administration leaders to provide them with information to allow them to make intelligent choices as they downsize the federal government. It will be particularly important to protect a reasonable level of funding for curiosity-driven, and long-term research.

These steps are not insignificant and those who can take them will succeed in the coming changed research environment.

The current academic landscape has been characterized by the University of Michigan's President James Duderstadt as follows:

"If we are to respond successfully to the challenges, opportunities, and responsibilities before us, we will need to develop the capacity to transform ourselves using entirely new paradigms that better serve a rapidly changing society and a profoundly changing world."

Daunting, but accurate words. Dr. Duderstadt lays out the challenges and opportunities before us. The outcome is crucial to our region and the nation. At Georgia Tech we plan to win our share of battle and look forward to seeing our sister institutions in the southeast there with us.

Thank you.